

## **BOEM ENVIRONMENTAL STUDIES PROGRAM: Ongoing Study**

**Region:** Pacific

**Planning Area(s):** Southern California

**Title:** A Demonstration Marine Biodiversity Observation Network (BON) for Ecosystem Monitoring (PC-15-05)

**BOEM Information Need(s) to be Addressed:** BOEM needs biodiversity information in all areas of the OCS acquired through a well-accepted, systematic methodology through abroad-scale, comprehensive, ecosystem-based monitoring of the marine environment. This information will enhance BOEM's environmental impact assessments and rule making for mitigation efforts.

**Total BOEM Cost:** \$1,250,000      **Period of Performance:** FY 2015-2020

**Conducting Organization:** University of California, Santa Barbara

**Principal Investigator:** Dr. Robert Miller

**BOEM Contact:** [Dr. Ann Scarborough Bull](#)

### **Description:**

Background: Biological diversity, or biodiversity, is defined as the variety of life, encompassing variation at all levels of complexity – genetic, species, ecosystems, and biomes – and including functional diversity and diversity across ecosystems. A growing body of research demonstrates that: (1) the maintenance of marine biodiversity (including coastal biodiversity) is critical to sustained ecosystem and human health and resilience in a globally changing environment; and (2) the condition of marine biodiversity offers a proxy for the status of ocean and coastal ecosystem health and ability to provide ecosystem services. Thus, managing our marine resources in a way that conserves existing marine biodiversity would help address other ocean management objectives (Palumbi et al. 2009). For example, it would provide information to enhance biosecurity against threats such as invasive species and infectious agents, enable predictive modeling, better inform decision making, and allow for adaptive monitoring and ecosystem-based Management.

As stated in the final recommendations of the Interagency Ocean Policy Task Force, it is the policy of the United States to protect, maintain, and restore the health and biological diversity of ocean, coastal, and Great Lakes ecosystems and resources

([http://www.whitehouse.gov/files/documents/OPTE\\_FinalRecs.pdf](http://www.whitehouse.gov/files/documents/OPTE_FinalRecs.pdf)). The Census of Marine Life, which concluded in 2010, greatly enhanced our understanding of the status of marine biodiversity. It also made clear the importance of clear-cut, systematic and sustainable approaches to observing and monitoring biodiversity across different levels and at a national scale.

In May 2010, the Biodiversity Ad Hoc Group under the Interagency Working Group on Ocean Partnerships convened a workshop of experts to develop a plan and recommendations for

attaining an operational marine biodiversity observation network (Marine BON) for the nation. The full workshop report can be found online at [http://www.nopp.org/wp-content/uploads/2010/03/BON\\_SynthesisReport.pdf](http://www.nopp.org/wp-content/uploads/2010/03/BON_SynthesisReport.pdf). In May 2013, workshop steering committee members published a paper in BioScience on the feasibility of establishing a Marine BON (<http://www.jstor.org/stable/pdfplus/10.1525/bio.2013.63.5.8.pdf>).

Through the National Oceanographic Partnership Program (NOPP), NOAA, NASA, BOEM, and the USGS (with other federal bureaus likely joining later) sent-out a request for proposals to address the recommendation from the 2010 workshop to initiate an integrated Marine BON demonstration project. The bureaus requested proposals for one or more broadly coordinated demonstration projects in U.S. coastal waters, the Great Lakes, and the exclusive economic zone (EEZ) that demonstrate how an end-to-end marine BON can be developed. “End-to-end” refers to integration of observations and historical data across multiple scales of diversity (genetic to ecosystem, microbes to whales), time (instants to centuries), and space (in situ to satellite remote sensing). Special consideration was given to proposals that demonstrate potential for establishing long-term, sustainable monitoring through partnerships.

The assessment of possible adverse risk from offshore energy development hinges critically on being able to differentiate human-induced effects from natural variability. Given the complexity of marine ecosystems and the possible effects of global climate change, this often requires making observations over large ocean areas, seasonally, and over multiple years and even decades to acquire reasonable statistical confidence. Towards that end, BOEM conducts long-term monitoring in selected areas and has plans for expanded monitoring in the Beaufort Sea (Marine Arctic Ecosystem Study (MARES)) and in the Atlantic (Atlantic Marine Assessment Program for Protected Species (AMAPPS II)).

These and earlier monitoring efforts range from single-species surveys (e. g. Bowhead Whale Aerial Survey Project (BWASP)) to more integrated ecological monitoring (e. g. Flower Garden Banks monitoring). The BON approach is to be highly ecological. The advantage of that to BOEM is the possibility of identifying which species in a given area are more vulnerable than others and which are more critical for the functioning of the ecosystem as a whole. Knowing that, BOEM can more precisely assess environmental risk and better decide on which mitigation efforts would be most beneficial overall.

Objectives: The objective of this study is to develop a prototype ecosystem-based marine biodiversity network, across a range of habitats, looking at multiple trophic levels and species, and informed by historical data and past modeling efforts to the extent possible. Such a network will include one or more of the following:

- (1) integration of and building upon existing monitoring and management programs with new approaches;
- (2) assembly and synthesis of existing programs and data to identify trends and gaps in taxonomic, spatial, and temporal coverage;
- (3) expand upon planned and recently-launched observing sites, systems, and programs;

- (4) employ innovative techniques for data discovery and methods that dynamically interrelate data sets and add value to existing monitoring data;
- (5) coordinate with or utilize Smithsonian Institution resources for lab space and lab time, data and observations, and taxonomic or other expertise;
- (6) collaborate with the U. S. Integrated Ocean Observing System (U.S. IOOS) participants including the U. S. IOOS Regional Associations for coastal, ocean and Great Lakes observations, infrastructure, data management and modeling capabilities; and
- (7) engage NOAA's National Oceanographic Data Center, U. S. IOOS, and/or USGS's Ocean Biogeographic Information System (OBIS-USA) for biological data and metadata management, archiving, discovery, and access.

**Methods:**

Through the National Oceanographic Partnership Program (NOPP), requests for proposals were broadly distributed. In response, research proposals have been submitted and will be evaluated by a panel of scientists with relevant research experience. BOEM and other co-funding agencies will be able to select which of the better-evaluated proposed projects they want to fund based upon their value to the agencies' missions.

**Current Status:** There are several diverse Marine BON projects ongoing on the U.S. Outer Continental Shelf, including this effort and an Arctic and Florida Keys effort. Dr. Robert Miller, the Principal Investigator, and Dr. Ann Scarborough Bull, the BOEM Project Officer, for this effort, were invited and attended an overarching Marine BON meeting during the February 2016 Ocean Science International Conference in New Orleans, Louisiana. Progress was presented to the public, and separately during the closed-session overarching BON meeting and at several "special information" days at UCSB during FY 2015 and Q1 and Q2 in 2016. The objectives are being met and preliminary results from Year 1 have been compiled and shared with NOAA, NPS, BOEM, NASA, and USGS collaborators and partners. This is a multi-dimensional study across state and federal groups and several separate universities and departments within campuses. Coordination has been successful and has established enduring pathways for the needed collaboration.

**Final Report Due:** June 30, 2020

**Publications Completed:** None

**Affiliated WWW Sites:**

<http://www.news.ucsb.edu/2014/014463/one-giant-step-ocean-biodiversity>

**Revised Date:** July 27, 2016

**Reference:**

Palumbi, S.R., P.A. Sandifer, J.D. Allan, M.W. Beck, D.G. Fautin, M.J. Fogarty, B.S. Halpern, L.S. Incze, J.A. Leong, E. Norse, J.J. Stachowicz, and D.H. Wall. 2009. *Managing for ocean biodiversity to sustain marine ecosystem services*. *Frontiers in Ecology and the Environment* 7:204- 211.